

Building Commissioning

Commissioning in the Energy Code

Commissioning requirements for all newly constructed nonresidential buildings are included in the 2013 update to Title 24, Part 6- California's Building Energy Efficiency Standards (Standards). Many of these requirements were moved from CalGreen (Title 24, Part 11), where commissioning was originally incorporated into state building code in 2008.

Commissioning requirements apply to all newly constructed nonresidential buildings, though the extent of the requirements depends on whether the conditioned floor area is less than 10,000 square feet or 10,000 square feet and greater.

The Standards define "newly constructed" as "a building that has never been used or occupied for any purpose" in [Section 100.1](#).

The commissioning requirements in Part 6 do not apply to residential projects (including high-rise residential), do not apply to additions or alterations and do not apply to newly constructed nonresidential buildings that are unconditioned.

Commissioning is critical to realizing the energy savings during building operation that were intended by the building design. Closely related to acceptance testing, commissioning involves functional testing during construction, but also includes activities during design that will ensure the building systems and associated controls will meet the owner's energy and operating efficiency goals.

Title 24, Part 6 defines commissioning as, "a systematic quality assurance process that spans the entire design and construction process, including verifying and documenting that building systems and components are planned, designed, installed, tested, operated and maintained to meet the owner's project requirements."

Commissioning Requirements

Commissioning requirements are included in [Section 120.8](#) of the Standards, and the table below illustrates which requirements apply based on conditioned floor area. Additional resources are listed that may provide valuable detail on how to properly implement these requirements.

Commissioning Requirements in Part 6	Conditioned Space	
	<10k ft ²	≥ 10k ft ²
OPR (§120.8(b))		X
BOD (§120.8(c))		X
Design Review (§120.8(d))	X	X
Commissioning in Construction Docs (§120.8(e))	X	X
Commissioning Plan (§120.8(f))		X
Functional Performance Tests (§120.8(g))		X
O&M Training (§120.8(h))		X
Commissioning Report (§120.8(i))		X

Table 1. Commissioning Requirements in Title 24, Part 6

Additional Resources

The following resources may be helpful in addition to the Standards language to understand the commissioning requirements:

- ★ [Building Commissioning Guide](#) in Nonresidential Compliance Manual: This guide outlines both an intent and compliance method for each requirement in Section 120.8.

Roles and Responsibilities

Because commissioning spans the entire building delivery process from pre-design through occupancy, many parties are involved, making communication and coordination paramount. Below is a list of who may need to participate in the commissioning process, at one time or another during the project.

- ★ Owner, owner's representative or facility operator
- ★ Designers (architect and MEP)
- ★ Design Reviewer (see table below)
- ★ Plans Examiner
- ★ General Contractor*
- ★ Key Subcontractors (HVAC, controls, TAB, etc.)*
- ★ Acceptance Test Technician*
- ★ Commissioning Agent*
- ★ Building Inspector*

* These parties are generally only involved for buildings with conditioned floor area 10,000 square feet or greater when §120.8(f) - §120.8(i) are required.

Who is most appropriate to fill each of these roles is dependent upon the experience and expertise of the project team. There are no requirements in the Standards that designate who the Commissioning Authority must be. However, for both the Design Reviewer and Acceptance Test Technician, there are restrictions on who can fill these roles.

Building Size	< 10,000 ft ²	10,000 - 50,000 ft ²	> 50,000 ft ²	Complex systems in Bldgs >10,000 ft ²
Allowed Design Reviewer	Any licensed professional engineer, including the engineer of record	A licensed professional engineer in-house to the design firm but not associated with the building project, or a third party licensed engineer	A third party licensed professional engineer	A third party licensed professional engineer

Table 2. Who can act as the Design Reviewer, per §120.8(d)

Information on becoming a certified Acceptance Test Technician can be found on the [California Energy Commission's Acceptance Test Technician Certification Provider webpage](#).

Additional Resources

The following resources may be helpful to understand roles related to the commissioning and acceptance testing process:

- ★ [Building Commissioning Guide](#) in Nonresidential Compliance Manual: Section 12.1 of this guide outlines roles and information on how to find a qualified Commissioning Authority.
- ★ [California Commissioning Collaborative](#): This organization includes a Provider List that may be valuable when searching for a Commissioning Authority.
- ★ [Section 10-103\(a\)1](#): This section in the Standards indicates that the Design Reviewer must be a licensed professional engineer.

Commissioning Process

Understanding and assigning who does what and when early during the process is key to success. For all newly constructed nonresidential projects, the Standards dictate that the commissioning process starts in early design, and compliance forms verifying this must be submitted to the building department with the project's application for permit.

Additional Resources

- ★ [Energy Code Ace Commissioning Infographic](#): This visual provides an outline of the commissioning tasks by when they occur during a typical project delivery process.
- ★ [Energy Design Resources e-news #96](#): This e-news titled [Commissioning for Compliance](#) was issued to help practitioners understand and implement the commissioning requirements of the Standards. It includes tips and tricks and a handy graphic that shows when during project delivery the commissioning requirements should be implemented.

Functional Performance Test Procedures

Commissioning is similar to acceptance testing in that functional performance tests are performed to “demonstrate the correct installation and operation of each component, system and system-to-system interface.” Section 120.8(g) says that functional testing performed to satisfy the commissioning requirements should be performed in accordance with acceptance testing procedures outlined in other sections of the Standards.

Note that the functional performance tests which are needed for commissioning are based on the systems documented in the OPR and BOD documents and may be more comprehensive than the project's required acceptance tests. A system not being included in the OPR/BOD does not exempt it from acceptance test requirements outlined in other sections of the Standards.

Additional Resources

The following resources may be helpful to better define functional performance testing requirements:

- ★ [Chapter 13 Acceptance Requirements](#) in the Nonresidential Compliance Manual: An overview of acceptance testing requirements, the process and the forms are further detailed in Chapter 13. [Table 13-1](#) includes a list of certificate of acceptance forms by building component.
- ★ [Nonresidential Reference Appendices NA7](#): This Section of the Nonresidential Appendices includes test procedures, roles and responsibilities and other details related to acceptance testing.

“Simple” Systems include:

- Unitary or packaged equipment listed in Tables 110.2-A, 110.2-B, 110.2-C and 110.2-E that each serve one zone; OR
- Two-pipe, heating only systems serving one or more zones

“Complex” Systems include:

- Fan systems each serving multiple thermostatically controlled zones; OR
- Built-up air handler systems (non-unitary or non-packaged HVAC equipment); OR
- Hydronic or steam heating systems; OR
- Hydronic cooling systems

Figure 1. “Simple” vs. “Complex” HVAC Systems

Commissioning Documents

In addition to the compliance forms (see below), there are documents that are required by Section 120.8 for buildings with conditioned floor area 10,000 sf and greater. These documents are used both to facilitate and document the commissioning activities:

- ★ Owner's Project Requirements (OPR)
- ★ Basis of Design (BOD)
- ★ Commissioning Specifications
- ★ Commissioning Plan
- ★ Functional Performance Tests
- ★ Operation and Maintenance Training Documents
- ★ Commissioning Report

Additional Resources

The following resources may be helpful to produce these required documents:

- ★ [Energy Design Resources e-news #96](#): The Commissioning for Compliance e-news provides more pragmatic detail and tips on each document listed.
- ★ [Building Commissioning Guide](#) in Nonresidential Compliance Manual: This guide provides an intent and compliance method for each document.
- ★ [California Commissioning Collaborative](#): Templates and sample documents are provided by this organization to facilitate commissioning in California.

Compliance Forms

All newly constructed nonresidential projects are required to complete the design review certificates of compliance, regardless of project size (See Table 1). At a minimum, the [NRCC-CXR-01-E](#) and [NRCC-CXR-02-E](#) must be completed. The project then uses the [NRCC-CXR-03-E](#) for “simple” HVAC systems, and the [NRCC-CXR-04-E](#) for “complex” HVAC systems (See Figure 1). The [NRCC-CXR-05-E](#) is also completed for all projects requiring compliance with Section 120.8.

Although there are no commissioning forms other than the certificates of compliance, the NRCA forms (certificates of acceptance) are used to document functional performance tests for the inspector to review.

Additional Resources

The following resources may be helpful to prepare the project team for completing compliance forms, and the enforcement agencies for reviewing them:

- ★ [Energy Design Resources e-news #96](#): This e-news includes more detail on each compliance form, including when it should be completed.
- ★ [Building Commissioning Guide](#) in Nonresidential Compliance Manual: Section 12.10 of this guide has detailed instructions on completing the compliance forms associated with commissioning.
- ★ [NRCA forms](#): The certificates of acceptance themselves are useful to understand required documentation.

Don't Forget About CALGreen!

Title 24, Part 11 (CALGreen) also includes requirements for commissioning in Chapter 5- Nonresidential Mandatory Measures. These requirements are complimentary to the Energy Code requirements, but be sure to read through them as additional systems such as renewable energy, landscape irrigation and water reuse systems are covered here

